January 10, 2000

D.T.E./D.P.U. 96-117

Petition of Commonwealth Gas Company, pursuant to G.L. c. 164, §69I et seq., for approval of its Long-Range Forecast Resource Plan for the five-year period November 1, 1996 through October 31, 2001 pursuant to G.L. c. 164, §§ 69 I et seq.

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I. INTRODUCTION

On December 20, 1996, in accordance with G.L. c. 164, § 69I et seq., Commonwealth Gas Company ("Commonwealth" or "Company") and Hopkington LNG Corp. ("Hopkington") filed with the Department of Telecommunications and Energy (formerly the Department of Public Utilities ("Department") its Load Forecast and Resource Plan for the five-year period November 1, 1996 through October 31, 2001. The Department docketed this mat D.T.E./D.P.U. 96-117.

Pursuant to notice duly issued, the Department conducted a public hearing on April 15, 1997, at its Boston offic Evidentiary hearings were held on July 23 and September 29, 1997. The Attorney General of the Commonwealth ("Attor General") intervened as of right pursuant to G.L. c. 12, § 11E.

The Commonwealth presented two witnesses: Edward J. Schmidt, supply planning analyst and Barbara Stanos, supply planning analyst. Hopkington presented the testimony of James D. Rappoli, its financial vice president and treas Briefs were submitted by the Company, Hopkington and the Attorney General.

II. BACKGROUND

Commonwealth is a Massachusetts corporation and a subsidiary of Commonwealth Energy System – a Massach business trust. The Company is engaged in the sale and distribution of natural gas to residential, commercial, and indus customers in a service territory that includes approximately 230,000 firm service customers in a 1,067 square mile area central, eastern and southeastern Massachusetts (Exh. Com-1, at 6; Company Brief at 2).

III. THE DEMAND FORECAST

A. Standard of Review

Pursuant to G.L. c. 164, § 69I the Department reviews the long range forecast of each gas utility to ensure that t forecast accurately projects the gas sendout requirements of the utility's market area. The Department's regulations req forecast reflect accurate and complete historical data, and reasonable statistical projection methods. See 980 C.M.R. § 7.02(9)(b). A forecast that is based on accurate and complete historical data, as well as reasonable statistical projecti methods, should provide a sound basis for resource planning decisions. Colonial Gas Company, D.P.U. 93-13, at 2 (19 ("Colonial Decision); Boston Gas Company, 25 DOMSC 116, at 127 (1992) ("1992 Boston Gas Decision"); Berkshire Gas Company, 16 DOMSC 53, at 56 (1987) ("1987 Berkshire Gas Decision").

In its review of a forecast, the Department determines if a projection method is reasonable based on whether the methodology is (1) reviewable, that is, contains enough information to allow a full understanding of the forecast methodol appropriate, that is, technically suitable to the size and nature of the particular gas company; and (3) reliable, that is, pro measure of confidence that the gas company's assumption, judgments, and data will forecast what is most likely to occu 93-13, at 2; 1992 Boston Gas Company, at 127; 1987 Berkshire Decision at 55-56.

B. Forecast Methods

The Company forecasted demand for the following five customer classes: 1) residential heating; 2) residential non-heating; 3) commercial; 4) industrial; and 5) municipal (Exh. COM-1, at 37, Att. 8). The Company also presented forecasts for each of the Company's four opera divisions including Cambridge, Framingham, New Bedford, and Worcester (id.).

The Company stated that in the residential sectors, where individual customer loads are highly homogenous, the process developed two models, one for the number of customers and one for the average load per customer (id.). The t load is derived by multiplying these numbers (id.). In the commercial, industrial and municipal sectors where the individu customer loads are heterogenous, the Company built models to forecast the number of customers and total load (id.).

The Company relied on multiple regression analysis for its forecast model (id. at Att. 8-Appendix A). First, the Company established a historical relationship between a dependent variable and one or more independent (explanatory) through regression analysis (id.). Second, the Company performed a forecast of the values of independent variables fo period (id.). Finally, the Company applied the estimated parameters from the historical regression model and combined forecasted values of the independent variables (id.). This was used to forecast the future values of dependent variables

The Company stated that the forecasted aggregate sales demand is adjusted to obtain firm throughput by subtra Savings, Interruptible and Quasi-Firm Sales and adding Incremental Emerging Market Sales, Line loss, Company Use ar MIT Generator.[1] This is further adjusted to reach firm sendout by subtracting Firm Transportation (Exh. COM-1).

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1 The Company’s projections for the MIT generation facility are drawn directly from the Company’s contract with MIT and amount to 1,897.5 Bbtu per year (Exh. COM-1, at 65).

1. Adjusted Sales Data Used in the Forecast

The Company stated that WEFA's econometric studies incorporated the Company's sales data between 1978 ar 1995 (id. at 42). The Company chose this period due to the changes it underwent with demand side management ("DS programs, and transportation and interruptible service (id.).[2] The Company implemented certain adjustments to the data consistent time series (id. at 42-43).

Commonwealth Gas asserted that the econometric forecast results of aggregate sales were then adjusted by ren forecasted loads for DSM and firm transportation services to reach firm sendout requirements (id.). The Company statec components of aggregate sales as follows:

Aggregate Sales= Firm Sales

+ DSM[3]

+ Interruptible and Quasi-Firm Sales (excluding large scale electric generation)

+ Firm Transportation (id.).

2. Service Territory Specific Data Availability

The Company stated that its service territory covers six different Massachusetts counties. The Company used e and demographic data for each county where there is an operating division in the multiple regression analysis (id. at 44- Company also obtained the projected time series data for independent variables from WEFA's library of economic mode Massachusetts and its counties (id.). The Company noted that although there is a high level of detail in the forecast valu

[2] The changes include DSM programs, transportation service and interruptible service.

[3] The Company presented detailed DSM savings data in Att. 6.

potential independent values, the counties and combinations of counties used in modeling include geographic areas sigr than, and thus different from, the actual specific service territories included in the Company's four operating divisions (ic Company matched its four operating divisions to Massachusetts counties as follows (id.): Cambridge Division: Middlese County;

Framingham Division: Middlesex, Norfolk and Worcester Counties; New Bedford Division: Bristol and Plymouth Counties; Worcester Division: Middlesex and Worcester Counties.

C. Residential Space Heating Demand Forecast

The Company indicated that the residential space heating class accounted for more than one-half of the Compa sendout in 1995 (id. at 46; Att. 8 at 7). In addition, the Company noted that the average growth rate of 2.31 percent over 1990-1995 period is due to the overall growth of population in the service territory (Exh. COM-1, at 46). The Company stated that the average use per customer has also increased at an average rate of 0.90 percent per year over the same

The Company developed separate forecasts for the number of residential space heating customers and average customer and multiplied these two series to obtain the forecast of total residential space heating sales under normal wea (id.).

1. Number of Residential Heating Class Customers

The Company modeled the number of customers in each operating division as a function of county level number households, with the exception of Cambridge division, where the use of the number of households in the prior year resul statistical fit (id.). The Company used WEFA's database for the forecast values of relevant driver variables (Exh. COM-1

47; Att. 8-Appendix D). The Company projected that the number of residential heating customers will grow at an annual r 0.93 percent over the forecast period (id.).

2. Residential Heating Class Use per Customer

The Company modeled the usage per customer as a function of the real gas price, county level household size, order autoregressive term (i.e., usage per customer lagged one period) (id.). The Company also added the variable Effe Day ("EDD") to the explanatory variables in regressions where the usage per customer in each division is the dependent (Exh. COM-1, at 47). One exception to this is the New Bedford model where the company asserts that the use of EDD w cause multicollinearity[4] between EDDs and the other explanatory variables (id.).

The Company points to the statistical strength of its regression results indicating that the models explained at lea percent of the variation in average use per customer (Exh. COM-1, at 47, Att. 8, Appendix A). Based on these forecasts the Company projects an annual rate of decrease of 0.17 percent over the forecast period in average use per residentia customer (Exh. COM-1, Att. 8).

3. Residential Heating Class Total Sales

The Company projects that its total sales to residential heating class will increase from 21,175 BBtu in 1996 to 22,176 BBtu in 2001. This represents an annual growth rate of 0.76 percent (Exh. COM-1, at 48; Att. 8, at Table 3.3).

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4 This refers to the situation where there is either an exact or approximately exact linear relationship among the ex (driver) variables. The existence of this situation violates one of the assumptions of classical linear regression m causing regression coefficients to be indeterminate and their standard errors are infinite if multicollinearity is pe case of high but not perfect multicollinearity, estimation of regression coefficients is possible but their standard to be large. As a result, population values of the coefficients cannot be estimated precisely. See Damodar Guja Econometrics,(1979), at 187-188.

D. Residential Non-Heating Demand Forecast

The Company indicated that the residential non-heating class consumed about 1 percent of the Company's total sales in 1995 (Exh. COM-1, at 48). The Company also stated that the consumption of this class has decreased at an av annual rate of 2.59 percent and average use has fallen about 0.44 percent per annum over the 1990-1995 period (id.). Company applied the same methodology in forecasting total sales for this class as it did for the residential heating class

1. Residential Non-Heating Class Number of Customers

The Company used the number of residential heating customers and either county level number of households c level population in predicting the number of residential non-heating customers (id. at 49). The Company asserts that it in number of heating customers to account for conversions from the non-heating class to the heating class (id.). The Com that the number of residential non-heating customers will decline at an annual rate of 0.88 percent over the forecast peri

2. Residential Non-Heating Class Use per Customer

The Company's basic explanatory variable for sales per customer model is the household size for each county v is an operating division (id.; Att. 8). In addition, the Company applied the real price of gas in all divisions except for the Cambridge division where price is less significant due to the high density of rental properties and student population (Exh 1, at 50). The Company asserted that some other variables are also added to improve the explanatory power of the mod The statistical analysis results in the average use per residential non-heating customer decreasing at an annual rate of 0 over 1996-2001 period (id.; Att. 8, Table 3.4).

3. Residential Non-Heating Class Total Sales

The Company multiplied the number of customers and the average use per customer to reach the total sales for residential non-heating class. The forecast yielded results that the total sales would decline from 482.01 BBtu in 1996 to BBtu in 2001, reflecting a 1.65 percent annual decline rate (id.).

E. Commercial Class Demand Forecast

The Company stated that commercial sales accounted for 33 percent of total sales in Cambridge, and ranged fr percent in other divisions during the 1990-1995 period (Exh. COM-1, at 50-51; Att. 8 at 9-10). The Company forecasted a 2.38 percent annual growth rate in aggregate commercial sales from 1996 to 2001 (Exh. COM-1, at 51; Att at Table 3.4).

1. Number of Commercial Customers

The Company indicated that the most significant explanatory variable in forecasting the number of commercial c the number of customers in the previous year (Exh. COM-1, at 51; Att.8, at 10). To forecast the number of customers, t Company used county level service sector employment in each operating division except for the Framingham division, w number of households was used (id.). The Company projected the number of commercial customers to increase at an a rate of 2.75 percent over the forecast period (Exh. COM-1, at 51; Att. 8 at Table 3.4).

2. Commercial Sales Forecast

The Company established regression models to explain total aggregate sales rather than average use per custor commercial sector mainly because the customer profiles are heterogenous (Exh. COM-1; Att. 8). The Company used th county level, service sector employment as the main explanatory variable (Exh. COM-1, at 51; Att. 8 at 11). The Compan included other variables to contribute to the explanatory power of the model (Exh. COM-1; Att. 8). The Company used th price of gas, the number of service sector employees and EDD as driver variables (id.). The Company stated that the EI variables proved to be significant in all operating divisions except New Bedford where multicollinearity between EDDs and variables existed (id.).

Furthermore, the Company found the price of gas[5] to be significant in explaining the commercial sales in all divis except in Cambridge (id.). The elasticity of gas sales with respect to employment was found to be between 0.7 and 1.3, the division (id.).[6] The total sales were projected to increase by 2.38 percent, annually, over the forecast period (id.).

F. Industrial Demand Forecast

The Company indicated that the relative contribution of industrial sales to total sales varies among divisions. Bet 1990-1995 specifically, while industrial sales were 10 percent of total sales in Cambridge division, this share was 28 per Worcester, 17 percent in Framingham, and 15 percent in New Bedford (Exh. COM-1, at 52; Att.8 at 11).

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5 The Company deflated the price of gas variable by the U.S. producer price index throughout the estimations.

6 The term elasticity refers to the responsiveness of a certain variable with respect to a change in another variable percentage terms. The formula is percentage change in X/percentage change in Y. An elasticity of 1.3 indicates percent increase in the level of employment causes gas sales to increase by 1.3 percent.

1. Number of Industrial Customers

The Company used the previous year's number of customers and the price of distillate oil (as the price of compe for the models of current year's number of customers in all divisions except Worcester (Exh. COM-1, at 53; Att. 8 at 12). Additionally, the Company stated that the manufacturing sector employment was a significant variable in the Framinghan Worcester divisions (id.). The Company's resulting forecasts indicated that the number of industrial customers is expect decline over the forecast period by 0.46 percent per annum (Exh. COM-1, at 54; Att. 8 at Table 3.4).

2. Industrial Load

The Company used county level manufacturing employment and the price of gas relative to the price of distillate operating division to explain the total industrial load; satisfactory results were obtained except for the Framingham divisic only the manufacturing and the service sector employment levels were used (Exh. COM-1, at 54; Att. 8 at 12-13). The Company used the service sector employment as an explanatory variable in Worcester division forecast (Exh. COM-1, a Att. 8-Appendix A). The Company's forecast results indicated that aggregate sales in the industrial sector would increas an annual rate of 0.75 percent between 1996 and 2001 period (Exh. COM-1, at 53; Att. 8, at Table 3.4).

G. Municipal Demand Forecast

The Company stated that municipal sales take the least share in total sales and varies among the operating divis range between 3 and 6 percent). However, the growth rate in the past five years for this segment was greater than the o growth (Exh. COM-1, at 55; Att. 8 at 13).

1. Number of Customers

Considering a homogenous customer profile in this class, the Company modeled the number of customers as a the numbers in the previous year and the number of households in the relevant region (Exh. COM-1, at 55; Att. 8 at 13). Company forecast yielded an annual 2.47 percent growth rate between 1996 and 2001 (Exh. COM-1 at 56; Att. 8 at Tabl 3.4).

2. Municipal Load

The Company used the number of households per county in the Company's service territory or operating divisio primary explanatory variable (Exh. COM-1, at 56). The Company found that EDDs in the Cambridge division and the pr of gas in the Worcester division were significant in explaining the variation in Municipal Load (id.). The Company's fore results showed that the municipal sales should increase at an annual rate of 1.92 percent between 1996 and 2001 (Exh. at 57; Att. 8, at Table 3.4).

H. Predictive Power of the Model

The Company employed an ex post analysis to evaluate its econometric model's predictive power (Exh. COM-1, 60). The analysis involves deleting the last two years of data from the historical regression analysis and predicting them estimated parameters. A comparison of forecasted values with actual (realized) values is performed (Exh. COM-1, Att. The Company notes that the 36 of the 40 equations yielded a 5 percent difference between the two compared values (Ex at 60). According to the Company, these values represent robustness (Exh. COM-1, Att. 8, Appendix C at 1).

I. Analysis and Findings

In developing and applying multiple regression analysis for demand forecasting, the Company used data source WEFA which had county specific forecasted values of economic and demographic variables. The Company prepared s consumption models for residential heating, residential non-heating, commercial, industrial and municipal groups of cust the residential sector, the Company generated a series of individual econometric forecasts in terms of number of custom use per customer. Total sales figures were reached through the product of these two forecasted values. In other sector of customers and total sales were forecasted and average use per customer was derived by dividing the total load by the customers. All forecasts were done on the basis of each of the four operating divisions of the Company.

The Department finds that the Company has sufficiently documented its methodology for demand (sales) foreca this reason the Department finds that the Company's demand forecast is methodologically reviewable. The Department a that the Company developed a methodology based on econometric models to forecast sales which is technically suitable the nature of the Company. Additionally, the Department notes that the econometric methods employed by the Compan traditionally proven techniques and used extensively in the industry by local distribution companies. Thus, the Departmer the methodology used in demand forecast by the Company is appropriate.

The Department notes that the Company's demand forecasts categorize the customer groups on an operating d which is expected to enhance the reliability of forecasts. Also, the Department acknowledges that the methodology used Company in its demand forecast provides a minimal measure of confidence for its accuracy. The Department notes, how Company's forecasts of the customer groups by operating division using certain dependent variables, lack theoretical ju the sense of having no meaningful interpretation.

The Company chose the number of customers as one of the dependent variables in the residential class forecas customer load profiles present a high degree of homogeneity. However, the Department is concerned with the Company same dependent variable for commercial, industrial and municipal sectors, since load profiles in these groups are custo

Furthermore, the Company derives the average load per customer for these latter groups by dividing the forecasted total sales by the number of customers. Nonetheless, the Department notes that the total sectoral load forecasts still are usabl the Department finds the Company's demand forecast in commercial, industrial and municipal sectors is reviewable, app and reliable.

IV. SENDOUT FORECAST

A. Methodology

The Company's econometric model does not directly forecast the actual firm sendout requirements (Exh. COM-1 60). The Company first forecasts Aggregate Sales which it then adjusts to obtain the firm sendout requirements (id.). Th adjustment involves several steps.

1. Firm Throughput

The first step included the adjustment of aggregate sales to derive the Firm Throughput which is defined as:

Firm Throughput = Aggregate Sales

- Installed DSM Savings

- Interruptible and Quasi-Firm Sales (excluding large scale electric generation)

+Incremental Emerging Market Sales

+Line Loss

+Company Use

+MIT Generator

(id. at 62-63).

Then, in order to reach Firm Sendout the Company adjusted Firm Throughput for third party gas volumes transported using the Company's distribution system as shown in the following equation:

Firm Sendout = Firm Throughput

- Firm Transportation

(id. at 68).

a. Installed DSM Savings

The Company calculated savings from DSM measures installed before October 31, 1996 by using the methodolo approved in the Company's Gas Evaluation and Monitoring Study ("GEMS") compliance filing (id.). The Company treate savings from DSM measures installed after fiscal year 1996 as a supply resource (Exh. COM-1, at 63).

b. Interruptible and Quasi-Firm Sales

The Company indicated that interruptible quasi-firm sales volumes were forecasted based on historical data adju known additions and deletions to the customer base over the forecast period (id. at 64).

c. Incremental Emerging Market Sales

Incremental emerging market sales are new loads for projects known to be in progress and forecast to come on end of the forecast period (id.). The Company noted that these markets have been slow to develop (id. at 64-65).

d. Line Loss and Company Use Gas

The Company indicated that the forecast of Company use is based on historical data (which is less than 0.3 pe sendout) and the line loss is based on the Company's last rate case (which is fixed at 2.34 percent of firm sendout) (id. a

e. Contract with MIT

The forecast for the MIT generation facility is based on the Company's contract with MIT (id.).

2. Firm Sendout and Forecasting End-User Transportation

a. Introduction to Forecast of End-User Transportation

The Company expects a significantly higher level of firm transportation activity over the forecast period (id.). The Company indicated that its approach to forecasting allows it to consider first all firm demand for gas, and then deduct tha is met through firm End-User Transportation ("EUT") (id.).

Because of the difficulties underlying the EUT forecast, mainly due to the task of quantification of a large numbe and unforeseeable events and the lack of enough past experience and related data, the Company stated that it has comb migration scenarios incorporating both empirical historical customer data and the best judgement of the Company's staff

b. The Three EUT Scenarios

The Company's first scenario is a linear regression of EUT throughput against time, that is, a traditional trend ar (id.). The second one is a "Monte Carlo" simulation based on a combination of historical data and the Company's best ju of current and future events in the market which was previously discussed as uncertainties (id.). The last one is based o hypothetical case driven by a more aggressive assumption about the speed and depth of a transition to transportation wi customer classes (id.). The Company stated that these three scenarios generated three discrete projections of migration medium, and high cases (id.). The Company stated that it evaluated each outcome and believes that the "most likely" sce Monte Carlo simulation analysis which generated the middle value for expected amounts of transportation migration (id.). Company stated that the simulation took into account several factors and market trends that the Company believes are in likely to influence the migration rate in the future (id.). Under this scenario, the Company's forecast of total migration to transportation increases from 3,441 Bbtu in 1996 to 9,384 in 2001 (Exh. COM-1, Table 25 at 79).

B. Normal Year Sendout

The Company subtracted forecast EUT migration from Firm Throughput to reach its firm sendout requirements u normal weather conditions (Exh. COM-1, at 82). The Company forecasted an increase by 0.71 to 1.89 percent per year firm throughput across its operating divisions between 1996 and 2001 period (id. at 83-84). Since firm transportation wa expected to increase throughout the period, the Company's firm sendout is projected to decrease (id.). The Company ma following analysis specific to each division:

1. Cambridge Division

The Company indicated that the overall firm sendout is expected to decline 4.48 percent from 1996 to 2001 (Exh COM-1, Table 30 at 84). In this particular division, the Company predicts the highest decline in the commercial sector b percent (92 percent of the total decline in that division) primarily attributed by the Company to the migration of commerc customers to transportation service (Exh. COM-1, at 84).

2. Framingham Division

The Company expects the Framingham division to experience an overall firm sendout decline of 9.57 percent ov forecast period (id.). The Company stated that the commercial sector is expected to see 28 percent of its customers mi transportation service (72 percent of the total decline in the Framingham division) between 1996-2001 (id.). The forecas industrial customer migration to transportation indicates that the industrial sendout declines by 23.4 percent[7] during the f period (id.). The Company stated that contrary to Commercial and Industrial sectors, normal year sendout for the reside sector is expected to increase by four percent over the forecast period (id.).

3. New Bedford Division

The Company indicated that the New Bedford division is expected to experience a sendout decline in both comn industrial sectors but a growth in residential sector (id. at 87). The resulting net effect amounts to a six percent decline i the forecast period (id.).

4. Worcester Division

The Company indicated that the Worcester division is forecast to experience the greatest migration of load to transportation service among all divisions (id. at 88). The Company asserted that throughout the forecast period, althou residential sector is expected to gain a 7 percent load growth, the Worcester division is expected to lose 8.8 percent of t load due to commercial and industrial sectors' migration to transportation service (id.).

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[7] In the Company's filing, this rate was stated as 28 percent (See Exh. COM-1, at 86). However, the forecast figu of the Firm Sendout of 1732 BBtu in 1996 and 1326 BBtu in 2001 reflects that the rate is 23.4 percent during that period.

C. Design Year Sendout

The Company first transformed the annual forecasts into monthly sendout then, into daily base load and heating degree day factors which are used for adjusting the forecast to Company's design year and design day whether scenari

The Company used historical monthly sales information to reach monthly distribution of the forecasted annual se at 90). The Company derived daily base load and heating load per degree day for each month assuming that the month August are non-heat sensitive, base load months (id.). The Company treated the daily average of these two months' firm as the daily base load (id.). The Company subtracted the monthly total of daily base load from each month's total firm se obtained the heat sensitive portion of the load (id.). The Company divided the heat sensitive portion of the load by month EDDs and obtained the monthly heating load per effective degree day (id.). The Company indicated that the daily base a heat per EDD terms constitute the components of the normal year forecast (id. at 90-91). The Company achieved the d standards by changing EDD patterns which reflect alternate weather scenarios (id. at 91).

D. Design Day Sendout

The Company computed the design day sendout by adjusting the daily base and January heat per EDD factors EDDs of January 16 which is a design day (id.). The Company asserts that the January heat per EDD and daily base f are computed from January firm sendout and incorporate all aspects of firm sendout (id. at 91-92).

E. Sendout Requirements Under Sensitivity Analysis

The Company asserts that the higher sensitivity of sendout forecast to potential changes in key variables will mal supply flexibility more important in setting up the Company's overall supply portfolio (id. at 92). The Company tested the of variations and uncertainties of socio-economic drivers (variables) under different scenarios in the course of the forec (id.). The Company's economic scenario forecasts were based on high and low level realizations of above mentioned dı Company indicated that they were developed to indicate 90 percent confidence level (id. at 93). The Company showed sendout forecast yielded an overall spread of +/-2.66 percent and +/-2.81 percent from the base case sendout forecast Company also developed migration scenarios for EUT migrations which were set up at lower and higher than expected r (id.).

While the Company's Overall Low Demand scenario combines low economic growth with high EUT migration, th Overall High Demand scenario combines high economic growth with low EUT migration (id. at 94). The Company perforı an analysis of the impacts of these scenarios on the Company's supply portfolio which described in the following Resouı section (id.).

F. Analysis and Findings

The Company's econometric model forecasted the firm sendout requirements based on the aggregate sales fore normal year, design year and design day. These adjustment techniques and derivations are reasonable and are consist LDC applications approved by the Department. See e.g., Fitchburg Gas and Electric Light Company, D.P.U. 94-140, at (1996). Similar to the demand forecast the Company forecasted its sendout requirements for each of the four operating the basis of each customer rate class. This approach helps identify the sources of total sendout requirements and woulc yield more accurate forecasts.

The Company also evaluated the likely effects of EUT on sendout requirements. Considering the increasingly cc natural gas industry in Massachusetts, the forecast of sales customers' migration to transportation is significant. The De notes that the Company's three EUT scenarios contributed to the expected accuracy of its sendout forecast. The techni

the development of these scenarios are traditionally proven and reasonable.

Thus, the Department finds that the Company's forecast of transportation migration is appropriate, reviewable ar reliable. In making this finding, the Department notes that the Company has limited information and experience on custo migration to transportation. The Department expects that, in its next filing, Commonwealth Gas will incorporate its transpo migration experience as well as the experience of other Massachusetts LDCs into its forecast.

The Company also performed sensitivity analyses of sendout forecast to potential changes in key driver variable Company based its alternative "Economic Scenarios" on high and low level realizations of these variables and created a confidence level. This yielded an overall spread of +/-2.66 percent and +/-2.81 percent from the base case sendout fore

Accordingly, the Department finds that the Company's overall methodology in forecasting the sendout requireme appropriate such that it contains enough information to allow a full understanding of the forecast methodology. Furthermo technical analysis used in its sendout forecast is suitable to the size and nature of the Company and presents a measur that the Company's assumptions, judgement, and data will produce an accurate forecast. For these reasons, the Depart that the Company's forecast of sendout requirements for the normal year, design year and design day sendout for the r commercial, industrial and municipal rate classes is appropriate and reliable.

V. THE PLANNING STANDARDS

A. Standard of Review

Pursuant to G.L. c. 164 §§ 69I, the Department is required to ensure "a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost." In accordance with this mandate

Department reviews the long range forecast of each gas utility to ensure that the forecast accurately projects the gas ser requirements of the utility's market area (G.L. c. 164 § 69I). A forecast must reflect accurate and complete historical da reasonable statistical projection methods (G.L. c. 164, § 69I; 980 C.M.R § 7.02 (9)(b)). Such a forecast should provide sound basis for resource planning decisions. Colonial Gas Company, D.P.U. 96-18, at 4 (1996); Bay State Gas Compa D.P.U. 93-129, at 5 (1996); and Holyoke Gas and Electric Department, D.P.U. 93-191, at 2 (1996).

In its review of a forecast, the Department determines if a projection method is reasonable based on whether the methodology is: (a) reviewable, that is, contains enough information to allow a full understanding of the forecast methodo appropriate, that is, technically suitable to the size and nature of the particular gas company; and (c) reliable, that is, pro measure of confidence that the gas company's assumptions, judgements, and data will forecast what is most likely to occ 96-18, at 5; D.P.U. 93-129 at 5; D.P.U. 93-191 at 2; Haverhill Gas Company, 8 DOMSC 48, at 50-51 (1992). Specifically, the Department examines a gas company's: (1) planning standards, including its weather data; (2) method, including the forecast results; and (3) derivation and results of its design and normal sendout forecasts. See D. 18, at 5; D.P.U. 93-129 at 5-6; see also Boston Gas Company, D.P.U. 94-109 (Phase I), at 9 (1996). As part of the review of the forecast, the Department also examines the company's scenario analysis which is used for evaluating t the Company's planning process, including any cold-snap analysis and sensitivity analysis. See D.P.U. 93-129, at 23-2 D.P.U. 94-109 (Phase I) at 61-66.

B. Previous Sendout Forecast Review

In Commonwealth Gas Company, D.P.U. 92-159, the Department approved Commonwealth's 1992 sendout F&SP with the stipulation that the Company address the following issues in its next F&SP. In particular, Commonwealth Gas was directed to:

(1) provide an analysis of the cost and reliability of using external EDD data for its weather planning standa while the Company continues to collect internal EDD data (Exh. COM-1 at 132);

(2) provide an analysis of the costs and benefits associated with a range of design year standards (id. at 1

(3) provide information regarding the design year and design day standards used by representative gas uti the region and throughout the country, and justify the Company's chosen level of reliability with reference to those utilities (id.);

(4) quantify the costs associated with customer demands exceeding design levels (id.);

(5) (a) demonstrate that it has continued to explore ways to enhance its forecasting model, particularly the predictive ability of the model was low;

(b) explain the difference in the predictive ability of the model between Cambridge and the Compa divisions; and (c) evaluate the predictive power of all models over the past four years (id. at 134

(6) provide territory-specific studies designed to develop a reliable database of building types, energy use, market potential for small-scale cogeneration development (id. at 135);

(7) provide further documentation of its gas-fired air conditioning forecast methodology, natural gas foreca methodology, electric conversion market forecast methodology, and DSM forecast methodology based expanded experience of the Company and any new advances in these markets (id. at 137);

(8) provide a detailed methodology for forecasting load additions in the G-53 market, including a specific a market potential and marketing programs, and consider providing a range of forecasts for this class tha at a minimum, the likely high and low demand scenarios (id. at 138);

(9) specify how the Company includes the load forecast outside the econometrics model in its design day f provide an analysis of the sendout per DD for exceptionally cold days (id. at 139);

(10) explain the differences in its processes for acquiring commodity and capacity resources including trans and storage services (id. at 141);

(11) implement a methodology to compare conservation resources to other supply-side resources (id. at 14

(12) discuss the Company's efforts to devise an appropriate methodology for comparing conservation resou other supply-side resources (id. at 144);

(13) re-examine the continued reliance on firm supplies to refill the Company's storage (id. at 145); and

(14) document how each identified supply addresses the Company's portfolio needs (id. at 146).

C. Planning Standards

The first element of the Department's forecast review is an assessment of a company's planning standards whicl a basis for projecting its sendout forecast. The sendout forecast is used to ascertain the adequacy and cost of a compa plan.[8] The Department reviews a company's planning standards to ensure they are reviewable, appropriate, and reliable

The Department's review of planning standards is two-fold. First, the Department reviews the Company's weathe — the basic inputs upon which a company's planning standards are based. Second, the Department reviews the Compa standards -- how the Company arrived at its normal year, design year, and design day standards.

1. Weather Data

a. Background

While the Department supported the Company's efforts to continue collecting internal EDD data, it stated that the internal DD data for future wealth Gas filings absent the detailed analysis of external EDD data (id. at 15).

In its previous order, the Department determined that the Company failed to justify its continued reliance on deg ("DD") data as the basis from which it projects its resource needs (D.P.U. 92-159, at 12). Accordingly, the Department directed Commonwealth Gas to provide a cost and reliability analysis of the potential forecasting improvements that woul the use of purchased EDD data ("Condition One") (id. at 13). While the Department supported the Company's efforts to continue collecting internal EDD data, it also stated that it would not accept the use of internal DD data for future Commo Gas filings absent the detailed analysis of external EDD data (id. at 15).

b. Company's Response

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8 Planning standards serve as guidelines to help an LDC evaluate whether it requires new resources or whether it surplus.

In response to the Department's Condition One directive, the Company acquired forty-one years of EDD and wi speed data for the Cambridge, New Bedford, and Worcester[9] operating divisions for the period 1955-1995 from the Wea Services Corporation ("WSC") (Exh. Com-1, at 15). The Company performed a comparative analysis of the purchasec EDD data to its own DD data using in-house econometric models used for load forecasting and resource planning (id.). Company notes that although the standard deviation of this comparison indicated a high degree of statistical similarity, th EDD data includes wind speed information in its formulations allowing for more accurate predictions regarding weather c (id. at 16). Further, the Company states that the purchased EDD data was statistically superior than the internal DD data virtue of a higher R-squared value, lower standard error of regression, and a higher log likelihood (id. at 15).

To further validate the Company's statistical findings, the Company retained the WEFA Group ("WEFA") (also retained by Commonwealth Gas to develop its forecasts) to perform an independent analysis of the two data sources. C Commonwealth Gas' conclusion, WEFA determined that the use of the purchased EDD information provided a more suit statistical fit in the resource modeling process (id.). The Company has therefore opted to utilize the purchased EDD dat consistently for all of its weather-related planning and analysis (id.).

c. Analysis and Findings

The Company has, through its statistical evaluations, provided reviewable information to the Department regardir potential improvements that may result from the use of purchased EDD data.

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9 As approved by the Department in its previous order, Worcester weather data was found to be appropriate in ter modeling sendout for Framingham (D.P.U. 92-159 at 15).

WSC's EDD weather data provides historical weather patterns for forty-one years compared to the Company's i DD data for eight years. Also, inherent in EDD data is the ability to include wind speed data in its calculations -- an opti afforded with DD data. Based on these two variables alone, it is reasonable to project that EDD data is more likely to ref appropriate range of future territory-relevant weather patterns than DD data that was historically used by the Company. Further, the Department notes that the statistical analyses performed by the Company, and independently supported by reasonably back this hypothesis and remain uncontested in the record. The Department has previously approved of the weather database as appropriate for input into the planning standards of Colonial Gas Company's Long Range Forecast Resource (Colonial Gas Company, D.P.U. 96-18 at 8). Accordingly, for the foregoing reasons, the Department finds tha WSC's weather data provides an adequate database from which to forecast the sendout requirements within Commonwe service territory. Moreover, the Department finds that the Company has complied with the directives contained in Cond Overall, the Department approves the Company's external EDD weather database and finds that it is reviewable, appropr reliable.

2. Normal Year

a. Description

Commonwealth stated that it constructed its 365-day normal year standard based on the daily average of forty- (1955-1995) of EDD data (Exh. Com-1 at 16). The Company further stated that, in an effort to "build in as much realism possible," it modified the forty-one year daily average EDD data to reflect more accurately the daily distribution of EDD each division (id. at 17). To do this, the Company compared the statistical total number of degree days in each division totals in each of the forty one years of divisional weather history. Next, the Company selected the actual year that was c statistical EDD total. Developing the average EDD required computing the ratio of each month's statistical degree days t month in the statistical normal year, and multiplying each actual day's EDD by this ratio (id.). The Company asserts that selected methodology for developing its normal year standard combines the statistical strength of a forty-one year arithm EDD with a divisional distribution pattern based on historical experiences (id.). The resulting modified normal year EDD standards are 6,148 for the Cambridge Division; 5,994 for the New Bedford Division; and 7,245 for both the Worcester a Framingham Divisions (id.).

b. Analysis and Findings

The use of an arithmetic average historical EDD data to establish a normal year standard has previously been a

by the Department (Commonwealth Gas Company, D.P.U. 92-159 at 15, Colonial Gas Company, D.P.U. 96-18 at 9; Colonial Gas Company, D.P.U. 93-13 at 10). Because the Company's planning circumstances are similar to that found aforementioned, the continued use of an arithmetic average historical EDD remains relevant and appropriate. Based on reasons, the Department finds that the Company's methodology for determining the normal year standard is reviewable a appropriate, and reliable.

3. Design Year and Design Day Standards

a. Background

In its previous order, and in an effort to further evaluate the tradeoff between reliability of the supply forecast ar of developing alternative design standards, the Department directed the Company to (1) provide an analysis of the costs associated with a range of design year and design day standards ("Condition Two"); and (2) survey other LDCs regardi used to determine design year and design day standards ("Condition Three") (Exh. COM-1, at 18).

In response to the Department's Condition Two directive, the Company analyzed the costs and benefits of altern standards (id.). The Company asserts that it must compare the costs of firm supply resources with the expected cost fr supply short-falls to formulate the optimal design standard (id. at 26). In addressing the Department's Condition Three d the Company surveyed thirteen LDCs and three trade associations regionally and nationally (id. at 18). According to the

Company, eleven area LDCs responded to the survey [10] (id.). Five of the surveyed LDCs base their design year standa coldest winter recorded historically while the remaining six use a design probabilities formula for the winter ranging from 1:100 (id. at 18-19).

The Company asserts that its current evaluation and selection of its design standards appropriately balances va resource reliability, cost, and potential migration of firm sales customers to firm transportation service (id. at 11). Accor and based on its LDC survey and cost/benefit analyses, the Company submits its revised design year planning standard fifty) and design day planning standard (one in fifty) (id. at 10-11).

b. Description of Design Year Standard

The Company stated that its design year standards are: 6,785 EDD for the Cambridge division; 6,676 EDD for t New Bedford division; and 7,866 EDD for both the Worcester and Framingham divisions (id. at 14). These standards,[11] according to the Company, are representative of a 1:50 probability of occurrence and differ in evaluative methodologies design year standards of 1:100 submitted in its previous filing (id.).

The design year standard is the estimated annual demand associated with the most extreme annual temperature that can reasonably be expected to occur (id.). According to the Company, the design year standard is optimized at the the marginal cost of procuring additional supplies above its anticipated firm demand requirements is equal to the margina

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[10] The following LDCs were surveyed regarding their design planning standards: Baltimore Gas & Electric, Bay St Gas, Berkshire Gas, Boston Gas, Colonial Gas, Connecticut Natural Gas, Fitchburg Gas & Electric, Providence Gas, Southern Connecticut Gas, Vermont Gas Systems, and Yankee Gas (Exh. COM-1 at Att. 7).

[11] The formula used by the Company to compute its newly developed design year standard assumes the following relationship: Normal Summer EDD + Normal Winter EDD + (Standard Deviation of Winter EDDs * 2.054)

unsupplied demand each weighted by an assigned probability of occurrence (id. at 26). The Company states that the su cost components represents its estimated "damages" and was evaluated with a range of design year standards and two s representing the low and high damage estimates (id. at 29). Further, the Company asserts that an important component establishing its design year standard is the likelihood of different levels of winter season demand (or probability of occur computed by the distributions of seasonal EDDs to estimate a distribution of system-wide seasonal demand (id. at 27). I the Company states that it incorporated the January and February 1994 cold snap in its design year model to capture th prolonged periods of extreme cold (id. at 33). The Company asserts that this incorporation in the design year model cor statistical strength with the realism of actual recent history (id.). To further ensure resource reliability, the Company stat can obtain short-term resources should it experience another near 1:50 winter (id. at 32). The Company explained that i its cost/benefit model to evaluate numerous design year standards and concluded that the most appropriate design year occurs at a two percent[12] (or one in fifty) probability of occurrence (id. at 32).

c. Analysis and Findings

In D.P.U. 92-159, the Department directed the Company to address the design year justification issues as outlir Condition Two and Condition Three. In response to those directives, the Company conducted a comprehensive statistical and cost/benefit analyses associated with a range of pot year standards and collected information regarding the design year and design day standards used by representative ar Accordingly, the Department finds the Company has complied with Condition Two and Condition Three. The Departmen

12 As stated by the Company, the two percent represents the number of degree days needed to reflect the probabi occurrence in a one-in-fifty winter (id. at 32).

however, remains concerned that, in light of the recent changes in the industry, the Company's selected 1:50 design yea remains moderately conservative relative to the majority of surveyed area peer LDCs and does not necessarily maximize commodity cost/reliability relationship.

The Department recognizes that it is appropriate for LDCs to employ conservative assumptions in developing de year standards (the primary basis for resource planning) in order that the firm customer (and the LDC) attain a high leve supply security. As the gas commodity marketplace continues to evolve, however, and resource acquisitions become in more flexible and capable of promoting reliability at a lower cost, such a "supply security" may become detrimental to the customer. In the Department's recent gas unbundling order (D.T.E. 98-32-B), the Department determined that, at preser upstream capacity market was not sufficiently competitive to warrant the immediate elimination of the LDCs obligation to Therefore, the Department concluded that, in order to ensure reliable gas deliveries at reasonable prices, the LDCs mus year transition period, retain the obligation to plan for and procure capacity resources (D.T.E. 98-32-B at 58-59). As a result, the LDCs will be required, for the interim, to fulfill the obligation of providing service reliability at the lowest possibl In order to maximize this cost-to-reliability relation during this transitional period, LDCs will need to match their firm reso entitlements to their firm requirements. Failure to provide a competitive commodity resource could provide the impetus f customer migration. This would increase the burden on the Company's remaining firm customers. The Department not approximately ninety percent of the Company's existing gas contracts have load loss provisions thereby insulating firm cu from migration repercussions. The remaining ten percent of the Company's commodity purchase contracts, however, do such provisions (RR DTE/DPU-8). Consequently, firm sales migration may adversely and inequitably impact the captive firm customer via the cost of gas adjustment clause ("CGAC") for stranded gas costs associated with these contracts.

The Company's design planning standards assume that all firm customers are willing to pay for the same level o reliability. This is not necessarily true as evidenced by the Company's historic "significant" migration of firm sales custo as the high level of projected (yet speculative) firm service migration (Exh. COM-1 at 2). This indicates, to some extent, segment of firm customers does not desire service reliability at a premium price. The cost implications of the level of se reliability built into the design year (and consequently the resource plan) may be driving firm customers to seek supply a Therefore, the service reliability offered by the Company may not be entirely consistent with customer's perceptions of t The Department finds the Company's proposed design year standard to be reviewable and reliable. Given the concern standard in combination with the developments in the natural gas market, the Department notes that the Company's desi standard may lead to oversubscribing resources to provide firm customers a higher-than-desired level of reliability.

As a requirement for approval of its next F&SP, however, the Company must continue to provide comprehensive cost/benefit evaluations to justify the appropriateness of its selected design year standard in light of the changes that wil the gas industry.

d. Description of Design Day Standard

The Company states that its design day standard of 80 EDD for the Cambridge division; 74 EDD for the New Bedford division; and 85 EDD for the both the Worcester and Framingham divisions were calculated based on a 1:50 probability of occurrence (Exh COM-1 at 14). The design day standard, as defined by the Company, represents the hig EDD of the year, requiring the Company to have sufficient firm resources in place to serve its firm customer gas loads w relying on the uncertainties of the short term markets during periods of severe winter weather (id. at 31).

The Company asserts that the derivation of its design day standards is similar to the methodology used for devel

design year standard and consists of the average peak day EDD during the 1955-1995 period, the standard deviation ar

average peak day, and a probability factor from the normal distribution (id. at 34). The Company states that its design d

the actual peak day that occurred during a 1994 cold snap. The Company developed its cold snap analysis by using the

EDD patterns of January through February 1994 within its design year (id. at 35). The Company further states that its

selection of a design day standard represents the midpoint of the range of probability values of high and low supply shor

e. Analysis and Findings

Although the Company's selected design day standard closely correlates to the peer LDC sampling and has bee

evaluated using cost/benefit criteria, the Department nevertheless remains concerned of its adequacy in light of industry

As stated in Section V.C.3.c., above, an overly conservative design planning standard in an increasingly competitive env

equates to a costly and non-competitive commodity portfolio. As a result, firm customers migrate to more competitive co

sources subsequently re-distributing the gas costs among the remaining firm customers. To counter these changes, sho

commodities and spot market gas are becoming more prevalent in the gas industry and is a likely means for LDCs to em

conservative standards and control their delivery obligations during peak periods more reliably and cost effectively.

For the foregoing reasons, the Department finds that the Company's method for determining design day standar

reviewable, reliable, and minimally appropriate. The Department directs the Company, in its next Forecast and Supply P

filing, to continue to provide comprehensive cost/benefit evaluations to justify the appropriateness of its selected design d

in light of the changes that are taking place in the gas industry.

4. Conclusion on Planning Standards

The Department has found that (1) the weather data used by the Company in this filing is reviewable, appropriat reliable for use in the development of its planning standards; (2) the Company's normal year standard is reviewable, app and reliable; (3) the Company's design year standard is reviewable, minimally appropriate, and reliable; and (4) the Cor design day standards is reviewable, minimally appropriate and reliable. In light of an increasingly dynamic and uncertai commodity market, the Department notes that future alternative service offerings may enable LDCs to serve their firm cu reliably utilizing less conservative design standards. The Department therefore encourages the Massachusetts LDCs to to institute innovative demand and supply side options to optimize their competitive positions in a changing environment w maintaining service reliability for their firm customers. The Department notes that the implementation of such options wi inevitably benefit the Company in an evolving era of competition.

I. THE SUPPLY PLAN

A. Standard of Review

The Department is required to ensure "a necessary energy supply for the Commonwealth with a minimum impac environment at the lowest possible cost." G.L. c. 164, §691. In fulfilling this mandate, the Department reviews a gas company's supply planning process and the t major aspects of every utility's supply plan -- adequacy and cost.[13] Commonwealth Gas Company, D.P.U. 92-159, at 53 Colonial Gas Company, D.P.U. 93-13, at 49-50; 1992 Boston Gas Decision, 25 DOMSC at 201.

The Department reviews a gas company's five-year supply plan to determine whether the plan is adequate to me projected normal year, design year, design day, and cold-snap firm sendout requirements (see Section III.D., below).[14] order to establish adequacy, a gas company must demonstrate that it has an identified set of resources which meet its p under a reasonable range of contingencies. If a company cannot establish that it has an identified set of resources whic requirements under a reasonable set of contingencies, the company must then demonstrate that it has an action plan wh projected sendout in the event that the identified resources will not be available when expected. Colonial Gas Company, 18, at 31; Commonwealth Gas Company, D.P.U. 92-159, at 54; Colonial Gas Company, D.P.U. 93-13, at 50.

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13 G.L. c.164, §69I also directs the Department to balance cost considerations with environmental impacts in ensur the Commonwealth has a necessary supply of energy. Colonial Gas Company, D.P.U. 96-18, at 31; Commonw Gas Company, D.P.U. 92-159, at 53; Colonial Gas Company, D.P.U. 93-13, at 50.

14 The Department's review of reliability, another necessary element of a gas company's supply plan, is included w Department's consideration of adequacy. See Colonial Gas Company, D.P.U. 93-13, at 50, n. 22; 1992 Boston Gas Decision, 25 DOMSC at 201, n. 87; Boston Gas Company, 16 DOMSC 173, at 214 (1987).

In its review of a gas company's supply plan, the Department reviews a company's overall supply planning proce An appropriate supply planning process is essential to the development of an adequate, low-cost, and low environmental resource plan. Pursuant to this standard, a gas company must establish that its supply planning process enables it to (1 and evaluate a full range of supply options, and (2) compare all options -- including conservation and load management ("C&LM") -- on an equal footing. Colonial Gas Company, D.P.U. 96-18, at 31; Commonwealth Gas Company, D.P.U. 92-159, at 54; Colonial Gas Company, D.P.U. 93-13, at 51; 1992 Boston Gas Decision, 25 DOMSC at 202.[15]

Finally, the Department reviews whether a gas company's five year supply plan minimizes cost. A least-cost sup plan is one that minimizes costs subject to trade-offs with adequacy and environmental impact. Commonwealth Gas Cor D.P.U. 92-159, at 55; Colonial Gas Company, D.P.U. 93-13, at 51-52; 1992 Boston Gas Decision, 25 DOMSC at 203. Here, a gas company must establish that application of its supply planning process has resulted in the additior options that contribute to a least-cost plan.

B. Previous Supply Review

In D.P.U. 92-159, the Department found that the Company had demonstrated progress toward implementing a supply planning methodology which treats C&LM on an equal footing with other resource options. Commonwealth Gas

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15 G.L. c. 164, §69I, requires a utility company to demonstrate that its long-range forecast "include[s] an adequate consideration of conservation and load management." Initially, the Siting Council reviewed gas C&LM efforts in of cost minimization issues. In the 1988 Commonwealth Gas Decision, 17 DOMSC at 122-126, the Siting Council expanded its review to require a gas company to demonstrate that it has reasonably considered C&LM programs as resource options to help ensure that it has adequate supplies to meet projected sendout requireme

Company, D.P.U. 92-159, at 86. Although, the Company did not have the information to compare conservation resourc

with other supply-side resources, the Company believed that conservation would reduce demand on its supply plan by tw

Id.

C. Base Case Supply Plan

1. Pipeline Supplies and Storage Facilities and Services

a. Pipeline Supplies

i. Capacity Contracts

The New Bedford, Cambridge and Framingham operating divisions receive supplies from the Algonquin pipeline which is primarily supplied by the Texas Eastern pipeline system (Exh. COM-1, Att. 12). Commonwealth indicated that Algonquin supplies them with firm transportation capacity under (1) rate AFT-E (no notice transportation) for 89,316 Dth/day; (2) rate AFT-1 for 57,383 Dth/day[16]; and (3) rate X-33 for 40,000 Dth/day for firm transportation service to Commonwealth's Marathon interconnect (id.).[17]

As a result of the unbundling of Algonquin's F-2 and F-3 services, the Company was assigned firm transportatio capacity on Consolidated Natural Gas Transmission Company ("CNG"), Transcontinental, National Fuel and Texas Gas, well as additional capacity on Texas Eastern (“TETCO”) and Tennessee Gas Pipeline (“Tennessee”) (id.). Commonweal

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16 Commonwealth Gas indicated that AFT-1 and AFT-E replace the previous Algonquin F-1 service (id.).

17 The Company indicated that under the Marathon transportation contract, volumes are available as follows: (1) 5,000 MMBtu/day in the New Bedford Division; (2) 14,000 MMBtu/day in the Cambridge Division; and (3) 21,000 MMBtu/day in the Framingham Division (Commonwealth D.P.U. 92-159, HO-S-9).

indicated that it has contracted with CNG for firm transportation capacity under (1) rate CNGT for 11,792 Dth/day to deli gas from Steuben Storage to Tennessee; (2) rate CNGT for 9,388 Dth/day to deliver gas for injection purposes to Steube Storage; and (3) rate FTNN for 10,380 Dth/day to replace Algonquin's former F-2 service (id.). In addition, Commonwealth has a firm transportation service contract with Texas Gas for 1,802 Dth/day to replace Algonquin's forme F-2 service (id.). Finally, Commonwealth has two firm transportation service contracts to replace Algonquin's former F-3 service (id.). One contract is with Transco for 3,073 Dth/day and the second is with National Fuel for 3,073 Dth/day (id.).

TETCO transportation includes both long-haul and short-haul services used to transport gulf coast supplies and s volumes for delivery to Algonquin (id.). The TETCO system covers south Texas through New Jersey, and is composed c four access areas in the production regions of Texas and Gulf of Mexico and three market areas (id.).

Commonwealth indicated that TETCO supplies transportation capacity under (1) rate Contract Demand Service ("CDS") (no-notice service) for (a) firm transportation service of 33,165 Dth/day from the access areas to M3, specifica to Algonquin interconnects at Hanover or Lambertville, NJ, or the SS-1 and SS storage points, and (b) short-haul service of 1,342 Dth/day from the SS storage area to Lambertville and Hanover; (2) rate FT-1 for firm transportation service of 49,624 Dth/day from Algonquin's interconnection at Hanover or Lambertville, NJ, or at a SS-1 storage point; (3) rate FT-1 for firm transportation of 4,781 Dth/day, associated with Algonquin's former F-2 service, from the supply access areas to the interconnect with CNG at Oakford; (4) rate FT-S for firm transportation of 10,380 Dth/day, associated with Algonquin's form F-2 service, with a primary receipt point of Texas Eastern's interconnect with CNG at Leidy and deliver point of the Lambertville interconnect with Algonquin; and (5) rate FTS-7 and FTS-8 for firm transportation of storage withdrawals on the Texas Eastern system of 10,810 Dth/day from the Oakford interconnect with CNG to the Lambertville interconnect with Algonquin (id.).

Tennessee provides transportation for supply from the Gulf of Mexico, the Canadian border, the interconnection Iroquois pipeline, and market storage located in the Northeast, to Commonwealth's four city gates in the Company's Wor operating division (id.).

In the production area, Tennessee's system splits into three legs located in Texas, Western Louisiana, and East Louisiana. The Company purchases gas from various suppliers on these legs in amounts that correspond to allocated c Tennessee system is divided into six market zones, from South Texas to New England (id.).

Commonwealth indicated that Tennessee supplies transportation capacity under (1) rate FT-A for firm long-haul transportation service of 47,387 Dth/day; (2) 365 day firm short-haul transportation services contracts of 17,872 with receipt points in Zone 4 and delivery points at Commonwealth's city gates;[18] (3) rate FT-A for firm transportation from Zo 0 and Zone 1 production areas to Zone 3 and Zone 4 for 7,175 Dth/day;[19] and (4) rate NET-NI for firm service for 9,600 Dth/day[20] (id.).

ii. Commodity Contracts

18 These contracts are primarily used to transport supplies from Tennessee FS-MA storage and CNG GSST storage.

19 These contracts are unbundled capacity associated with the former Algonquin F-2 and F-3 services.

20 The contract is used to deliver storage supplies from Steuben Storage and to deliver Canadian supplies from Nia the Company's city gate.

Commonwealth has entered into firm agreements with nine suppliers on TETCO and seven suppliers on Tenness The Company asserts that it chose its suppliers based on each company's geographic diversity, financial stability, reliat corporate warranty, diversity of supply, and price competitiveness (id.). Moreover, TETCO and Tennessee allowed for adjustments to nominations on a daily, monthly and seasonal basis thereby matching the transportation services providec pipelines (id.).

The Company's firm gas supplies generally employ market-based pricing based on published indices and usuall reservation charge component (id.). With the exception of the Alberta Northeast contract of 4,500 Dth/day, all of the sur offer daily, monthly or seasonal flexibility and none have minimum take requirements (id.). The Company notes that it ha increasingly elected to procure its firm gas supplies on a short-term (one year or less) or winter-only basis, correspondi seasonal needs and reducing the overall cost of gas (id.). The Company supplements its firm purchases with purchases market (id.).

b. Storage Facilities and Services

Commonwealth indicates that it has two firm storage contracts with CNG: (1) rate GSS-TE for MDIQ[21] of 5,917 Dth/day and MDWQ[22] of 11,008 Dth/day for receipt, injection, storage and withdrawal services at underground storage fields in Pennsylvania and for delivery to an interconnect with Texas Eastern at Oakford, PA; and (2) rate GSS-T for MDIQ of 4,383 Dth/day and MDWQ=8,449 Dth/day for receipt, injection, storage and withdrawal services at underground storage fields in Pennsylvania and for delivery to an interconnect with Tennessee at Ellisburg, Pennsylvani

21 MDIQ: Maximum Daily Injection Quantity.

22 MDWQ: Maximum Daily Withdrawal Quantity.

In addition, Commonwealth states that it has five firm storage contracts with TETCO under rate SS-1 for MDIQ of 15,601 Dth/day and MDWQ of 44,559 Dth/day for receipt, injection, storage and withdrawal service at an SS-1 Storage Point for delivery to Algonquin interconnects at Hanover or Lambertville, New Jersey (id.). Commonwealth notes that it has a firm service contract with Tennessee under rate FS-MA for MDIQ=7,763 Dth/day and MDWQ=20,777 Dth/day for receipt, injection, storage and withdrawal service (id.).

In addition to its storage services on Tennessee, TETCO and CNG, the Company has firm storage entitlements a York, for MDIQ=8,929 Dth/day and MDWQ=11,364 Dth/day. This storage is accessible to Tennessee via CNG and is used on a seasonal basis in order to supplement Tennessee pipeline supplies (id.).

2. Supplemental Facilities and Supplies

a. Facilities

The Company utilizes liquified natural gas ("LNG") as a supplemental, or swing, supply and receives most of its L from two affiliated facilities (id). The Hopkinton facility has a total storage capacity of 3,120,000 MMBtu and is capable o vaporizing 240,000 MMBtu/day (id). The Acushnet facility provides 530,000 MMBtu storage capacity and up to 30,000 MMBtu/day of vapor into the New Bedford distribution system (id.).

By contract, the Marathon interconnect can be used to transfer a MDQ of 40,000 MMBtu of LNG vapor into the Algonquin system on the Company's behalf (id.). However, the Company indicated that Marathon could transfer up t 70,000 MMBtu/day subject to Algonquin approval (id.). The additional benefits of the interconnect include the ability to deliver Algonquin gas to the Worcester distribution system, to the LNG facility for liquefaction, and to the Tennessee pipe (id.). Tennessee gas can be delivered to the Algonquin pipeline (id.).

b. Supplies

In addition to the affiliated LNG facilities, the Company has two other sources of supplemental gas supplies. A contract with Distrigas provides for a gas supply of 755,000 MMBtu/year and 5,000 MMBtu/day, which can be delivered in the form of liquid or vapor to supplement the Company's LNG resources at Hopkinton and Acushnet (id.). If supplies are required, Commonwealth can renew this short-term contract annually (id.). The contract with Orange and R Utilities provides supplemental and seasonal supplies on Tennessee or into Algonquin from November 15th to April 15th c best-efforts basis (id.). The gas taken must be returned to Orange and Rockland before October 31 (id.).

3. Conservation and Load Management

The DSM programs recently approved in D.P.U. 95-114 are expected to have an impact of 72,650 MMBtu per year (id.). The commercial and industrial ("C&I") programs approved in D.P.U. 95-114 are new and were offered fo the first time after September 19, 1996 (id. at 2).

D. Adequacy of the Supply Plan

In reviewing adequacy, the Department first examines whether the company's base case resource plan is adequ its projected normal year, design year, design day, and cold-snap firm sendout requirements. If so, the Department revi whether the company's plan is adequate to meet its sendout requirements if certain supplies become unavailable. If the not adequate under the base case resource or contingency plans, then the company must establish that it has an action ensure that supplies will be obtained to meet its projected firm sendout requirements.

1. Normal and Design Year Adequacy

In normal and design year planning, Commonwealth must have adequate supplies to meet several types of requi Commonwealth Gas Company, D.P.U. 92-159, at 69. Commonwealth's primary service obligation is to meet the requirer of its firm customers (Exh. COM-1, at 96). In addition, the Company must ensure that its storage facilities have adequat inventory levels prior to the start of the heating season (id.). To the extent possible, Commonwealth also supplies gas to interruptible customers (id.).

Commonwealth's normal-year weather pattern is based on a 41-year average of EDD (id. at 125). The Compa presented a supply plan for meeting its forecasted normal year sendout and storage refill requirements throughout the fc (id. at 126). The plan shows that the Company has adequate supplies to meet forecasted sendout and storage refill requ under normal conditions throughout the forecast period. Accordingly, the Department finds that the Company has establ its normal year supply plan is adequate to meet the Company's forecasted sendout requirements and storage refill requir throughout the forecast period.

2. Design Day Adequacy

Commonwealth must have an adequate supply capability to meet its firm customers' design day requirements. \ total supply capability necessary for meeting design year requirements is a function of the aggregate volumes of gas ava contract period, design day supply capability is determined by the maximum daily deliveries of pipeline gas, the maximur which supplemental fuels can be dispatched, and the quantity of reliable C&LM available on a design day.

Commonwealth presented its supply plan to meet forecasted firm design day sendout requirements for each divi 92**)**. The Company stated that it currently forecasts meeting approximately 44% of the Company's design day sendout r using the Hopkinton LNG facility (id. at 116).

Commonwealth's supply plan shows that the Company has adequate resources to meet its forecasted firm desig sendout requirements except for a small unserved demand (49 BBtu) in 1997/98 (id. at 126). However, the Company indicates that this shortfall can easily be met through short-term acquisition of resources, such as interruptible spot supp purchases from Distrigas on a best-effort basis, off-system sales from other LDCs, and interruptible storage resources. Accordingly, based on the foregoing, the Department finds that the Company has established that its design day supply adequate to meet the Company's sendout requirements for the forecast period.

3. Cold-Snap Adequacy

Commonwealth asserted that not only does the Company's supply model for design weather demonstrate its abili the sendout requirements of a design year, but also its ability to supply an extraordinary cold snap period adequately an at 128).

E. Supply Planning Process

1. Standard of Review

The Department has determined that the supply planning process is critical in enabling a utility to formulate a re: plan that achieves an adequate, least-cost, and low environmental impact supply for its customers. Commonwealth Gas D.P.U. 92-159, at 73; Colonial Gas Company, D.P.U. 93-13, at 69-70; 1992; Boston Gas, 25 DOMSC at 223. The Department has noted that an appropriate supply planning process provides a gas company with an organized meth analyzing options, making decisions, and reevaluating decisions in light of changed circumstances. Commonwealth Ga: D.P.U. 92-159, at 74; Colonial Gas Company, D.P.U. 93-13, at 70; Boston Gas Company, 25 DOMSC at 223. For the Department to determine that a gas company's supply planning process is appropriate, the process must be fully documented. Commonwealth Gas Company, D.P.U. 92-159, at 74; Colonial Gas Company, D.P.U. 93-13, at 70; Boston Gas Company, 25 DOMSC at 223.

The Department's review of a gas company's process for identifying and evaluating resources focuses on wheth company (1) has a process for compiling a comprehensive array of resource options -- including pipeline supplies, trans and storage services, commodity, supplemental supplies, C&LM, and other resources; (2) has established appropriate c for screening and comparing resources within a particular supply category; (3) has a mechanism in place for comparing resources, including C&LM, on an equal footing, i.e., across resource categories, (4) has a process that, as a whole, er company to achieve an adequate, least-cost, and low environmental impact supply plan. Commonwealth Gas Company, 92-159, at 74; Colonial Gas Company, D.P.U. 93-13, at 70; Boston Gas Company, 25 DOMSC at 224.

2. Identification and Evaluation of Resource Options

a. Overview

Commonwealth asserted that the primary goal of its supply planning process is to provide least-cost and reliable firm sales customers (Exh. COM-1, at 96). The Company has assembled a flexible and diverse portfolio of resources ar employs a proven and reliable approach to demand forecasting and resource procurement that enabled it to meet this go

Commonwealth uses Electronic Data Services' ("EDS") SENDOUT linear programming ("LP") optimization model to calculate the least-cost dispatch of existing and incremental resources to meet the Company's load requirement Resource Mix module is an extension of the basic SENDOUT model and allows optimization of existing and new contract capacity levels by taking into account fixed charges as well as variable costs (id. at 100). The Company utilizes the outp by the model to identify the mix of resources required, excess resources, supply shortages, and the costs of serving der

The results provide the basis for the Company's five-year gas supply portfolio plan, including any modifications required projected demand (id. at 101).

The Company concludes that the SENDOUT model provides a mechanism for a detailed simulation of the least-c dispatch of the Company's supply resources under alternative demand scenarios (id.). In the case of Commonwealth, it Company's primary planning tool for testing the operational and economic consequences of a wide variety of supply anc alternatives (id.).

b. Supply-Side Resources

i. Description

As noted above, Commonwealth's supply-side portfolio includes pipeline supplies, firm and interruptible transpor storage service, spot supplies, and LNG.

However, the Company indicated that if additional pipeline supply, storage capacity or peaking capacity is nece Company would utilize other resource options including pipeline supplies, supplemental supplies, DSM resources, sharir arrangements with industrial and electric generation facilities, etc., to meet the added requirements (id. at 103). Commo indicated that should additional resources need to be used, the Company would request proposals from qualified vendor Upon receipt of the RFPs, Commonwealth would evaluate the supply source's reliability, availability date, diversity of sup flexibility, financial viability and other relevant ancillary criteria that may apply (id. at 104).

ii. Analysis and Findings

Previously, the Department has endorsed LDC acquisition processes that have involved the solicitation of compe bids from alternative suppliers. Colonial Gas Company, D.P.U. 96-18, at 49 (1996); Holyoke Gas and Electric Department, D.P.U. 93-191, at 30 (1996); Blackstone Gas Company, D.P.U. 95-15, at 7 (1996). The Department has also endorsed Commonwealth's process for evaluating commodity suppliers (see D.P.U. 94-174 (March 9, 1995)). Commonwealth utilizes price and non-price criteria and considers both short-term and long-term options. Accordingly, the Department finds that Commonwealth's process for i and evaluating supply-side resources is an appropriate means for deciding among such supply options.

c. Conservation and Load Management

i. Description

Commonwealth indicated that it identifies and evaluates DSM on an equal basis with available supply-side option 106). The Company states that it uses the same criteria, data and standards for testing demand-side resources as it us supply-side options (id.).

The Company notes that the avoided cost study used to screen programs was developed to support its 1995 DS pre-approval filing (id.). DSM programs developed from this cost-effectiveness analysis are included in the resource pla 107).

ii. Analysis and Findings

In identifying and evaluating conservation resources based on a technical potential study and avoided costs, the notes that the Company has developed a process for identifying and evaluating conservation resources. Moreover, the detailed, comprehensive, and in compliance with Department approved procedures. In addition, the Departments finds t Company has complied with the Department's directive that Commonwealth consider DSM on an equal basis with supply resources.

d. Spot Gas Supplies

The Company states that it supplements its firm purchases with purchases on the spot market (id.). This, Comm claims, has allowed it to take advantage of favorable market prices, while minimizing its exposure to fixed reservation cha From January through May 1997 the Company purchased 6,297,708 Dth of spot gas from various suppliers including: CNG, Louis Dreyfus and Texaco (Exh. DPU-31).

3. Consideration of All Resources on an Equal Footing and Compliance with Order Seven

The Department has consistently held that, in order for a gas company's planning process to minimize cost, that must adequately consider alternative resource additions, including C&LM option on an equal basis. Commonwealth Gas Company, D.P.U. 92-159, at 85; Colonial Gas Company, D.P.U. 93-13, at 83; Boston Gas Company, 25 DOMSC at 233.

In Commonwealth Gas Company, D.P.U. 92-159, at 85, the Department noted that Commonwealth had not provided a thorough analysis of how it compares the costs and benefits of Company-sponsored C&LM programs with the and benefits of obtaining new supplies. Therefore, the Department ordered the Company to implement a supply planning methodology which treats C&LM on an equal footing with other resource options, such that supply costs are minimized s supply adequacy consideration ("Condition Seven").

In D.P.U. 92-159, the Department found that the Company demonstrated progress toward implementing a supply planning methodology which treats C&LM on an equal footing with other resource options but that the Company did not h information to compare conservation resource "head-to-head" with other supply-side resource (id. at 86). In the Compa current filing, C&LM is treated on an equal basis with supply-side resources and accordingly, the Department finds that Company has complied with Condition Seven.

4. Conclusions on Supply Planning Process

The Department finds that Commonwealth has: (1) formulated an appropriate process for identifying a comprehe array of supply options and has developed appropriate criteria for screening and comparing supply resources; (2) formu appropriate process for identifying a comprehensive array of DSM options and has developed appropriate criteria for sc and comparing DSM resources; and (3) incorporated both supply-side and demand-side options in its resource mix, and compared all resources, including DSM, on an equal basis. Accordingly, the Department finds that Commonwealth has established that its supply planning process is sufficient to enable it to make least-cost supply decisions.

F. Least Cost Supply

1. Standard of Review

The Department reviews a gas company's five-year supply plan to determine whether it minimizes cost, subject t offs with adequacy and environmental impact. Commonwealth Gas Company, D.P.U. 92-159, at 89; Colonial Gas Compa D.P.U. 93-13, at 88-89; Boston Gas Company, 25 DOMSC at 236. A gas company must establish that the application of its supply planning process -- including adequate consideration of C&LM and consideration of all options on an equal -- has resulted in the addition of resource options that contribute to a least cost supply plan. As part of this review, the Department continues to require gas companies to show, at a minimum, that they have completed comprehensive cost s comparing the costs of a reasonable range of practical supply alternatives prior to selection of major new resources for t plans. Commonwealth Gas Company, D.P.U. 92-159, at 89; Colonial Gas Company, D.P.U. 93-13, at 88-89; Boston Gas Company, 25 DOMSC at 236.

2. Commonwealth's Least Cost Analysis

a. Introduction

The Company states that it has maximized the efficiency of its system and enhanced the Company's portfolio fle

instituting several measures (Exh. COM-1 at 108).

b. Release of Transco, National Fuel and Tennessee Capacity

Commonwealth determined that it could better optimize its resources by restructuring its F-3 capacity arrangem

conjunction with its interruptible delivery of Texas Eastern storage service (id. at 110). Commonwealth released the F-3

associated capacity on Transco and National Fuel at maximum rates and on Tennessee at 36 percent of the maximum ta

at 110-111). These releases enabled the Company to use the available capacity on Algonquin to receive gas deliveries

FTS-7 and FTS-8 services on Texas Eastern, resulting in the firm delivery of the Company's previously interruptible stora

deliveries on Texas Eastern (id. at 111). As a result, firm deliveries of city gate supplies increased from 3,063 MMBtu/day under the old F-3 service to 3,543 MMBtu/day under the new FTS-7 and FTS-8 arrangement (id.). In addition, the Company indicated that this restructuring resulted in the enhanced usage of an existing storage se

reduced demand charge obligations by approximately $276,000/year, as well as an expected annual savings of $629,00

storage management and increased portfolio optimization (id.).

c. Acquisition of NET-NI Capacity on Tennessee

Commonwealth negotiated for firm capacity of 9,600 MMBtu/day, previously being used by the Pepperell cogeneration project under the NET-NI rate schedule (id. at 113-114). In addition, the contract was modified to add Morrisville, New York as both a receipt point and delivery point and to replace Tewksbury, MA with Worcester, MA as a primary delivery point (id.).

The supply of 9,600 MMBtu/day of firm capacity plus a less than 50 percent reliability of interruptible transportation of the balance of the withdrawal volumes, provided the needed enhancement to reliability of Steuben servi 1995-96, the Company generated approximately $200,000 in incremental off-system sales margins and $20,000 in spot purchase savings from optimizing the flexibility of the new service (id.).

d. Hopkinton LNG Corporation Contract

i. Description

Commonwealth indicated that the Hopkinton LNG Contract enables the Company to liquefy and store LNG for lat vaporization when needed to meet peak winter season demands (id. at 116). This resource meets 44 percent of the Cor day sendout requirements (id.).

ii. Attorney General's Position

The Attorney General requested that the Department recognize the affiliate relationship between the Company, Hopkington and Commonwealth Energy System ("ComEnergy") and to affirm Commonwealth's customers' primary right access to, and interest in, Commonwealth's on-system capacity assets (Attorney General's Brief, at 1). The Attorney Ge states that the Department must facilitate Commonwealth's customers ability to migrate to firm transportation by expressly recognizing that all Commonwealth's' capacity assets, including on-system LNG capacity, are, in the first instance, asse "belonging" to firm customers (id., at 4).

iii. Hopkington's LNG's Position

Hopkington states that there is no proposal before the Department and no factual record upon which the Attorne General's request can be evaluated (Hopkington Brief at 1). Hopkington argues that the request is premature and that th Attorney General's request raises substantial legal and regulatory issues that cannot be addressed in a vacuum (id.).

Hopkington states that, as Commonwealth's customers migrate to transportation service, Hopkington could likely situation in which it has excess, unsubscribed capacity (id. at 2). Hopkington is preparing for this situation by securing authorization to offer storage and injection services to third parties (id.).

iv. Company's Position

In addressing the Attorney General's concerns, the Company states that migrating transportation customers' ac the Hopkington capacity is just one of many issues concerning capacity disposition that are being discussed in the Mass Gas Unbundling Collaborative (Company's Brief at 2). In addition, the Company states that it will not renegotiate its agre with Hopkington until after a restructured framework for the disposition of downstream facilities has been established be framework, as approved by the Department, will be critical in informing the Company's future decisions concerning how agreement would need to be amended (id. at 4).

v. Conclusion

The Department notes that the Attorney General's request is premature. Until negotiations for a subsequent co are completed and submitted for Department approval, we will not make a finding with regard to a possible renegotiated between the Company and Hopkington.

d. Firm Winter Supply Agreement with Distrigas

As a result of a renewable winter season gas supply agreement with Distrigas and Commonwealth's associated r long-haul capacity on Tennessee, Texas Eastern and Algonquin at maximum pipeline rates, Commonwealth states that th Company's firm sales customers experienced over $500,000 in savings (id. at 116). In addition, the substitution of Distri LNG for pipeline capacity during the 1996/97 winter season has increased the flexibility of the Company's resource port because a significant portion of the LNG was available to the Company in liquid form enabling it to be trucked to and stor Hopkinton LNG facility (id.).

e. NOVERGAS

The results of Sendout model runs indicated that the acquisition of a 90-day firm supply of 5,000 MMBtu/day coincident with the release of 6,000 MMBtu/day of 365-day firm capacity at the maximum rate would result in cost saving of over $700,000 per year without any resulting unserved demand (id. at 117). Therefore, the Company has entered int "Memorandum of Understanding" with NOVERGAS (a Canadian supplier) for three years of 90-day winter supplies beginning in November 1998 (id.). The agreement is contingent on the completion of the Portland Pipeline (id.).

3. Conclusions on Least Cost Supply

The Department finds that the Company has presented sufficient evidence to the Department establishing that it planning and acquisition process ensures the Company's ability to acquire resources to meet its needs at least cost. Mo Department finds that the Company has shown that the application of this process in conjunction with the use of the Send has resulted in the development of a supply portfolio that contributes to a least cost supply plan.

G. Conclusions on the Supply Plan

The Department has found that Commonwealth has established that it has adequate resources to meet its firm se requirements throughout the forecast period. The Department also has found that the Company's supply planning proce to identify a reasonable range of resource options and to perform an adequate evaluation of such options. Further, the I has found that Commonwealth has established that is supply planning process is sufficient to enable it to make least-cost decisions. In addition, the Department has found that the Company's decisions contribute to a least-cost supply plan. Accordingly, the Department approves the 1996 supply plan of Commonwealth Gas Company.

VII. COMPLIANCE WITH DIRECTIVES IN D.P.U. 92-159

In the Company's previous long-range forecast and resource plan, the Department directed the Company to adc fourteen issues prior to the filing of its next long-range forecast and resource plan. In this section, the Department will d the extent to which Commonwealth has addressed these directives.

The Company was required to provide an analysis of the cost and reliability of using external EDD data while the Company continues to collect internal EDD data. In response to Directive One, the Company purchased HDD and wind data for the Cambridge, New Bedford, and Worcester[23] operating divisions for the period 1955-1995, from the Weather Services Corporation ("WSC"), and calculated EDD according to WSC's formula (Exh. COM-1, at 132). The comparison of the in-house data to the WSC data indicated a high degree of statistical similarity (id. at 15). However, th Company indicated that it favors the use of the WSC data because it allows more effective and reliable weather evaluatic In addition, the Company submitted the weather data results from the in-house economic models to WEFA and WEFA recommended using the external EDD data because it provided a better statistical fit in the modeling process (id. at 133) Accordingly, the Department finds that the Company has complied with Directive One.

The Company was required to (1) provide an analysis of the costs associated with a range of design year stand incorporate the quantification of the costs and benefits associated with various design standards; (2) provide informatior design year standards and design day standards used by representative gas utilities and justify the Company's chosen l with reference to those utilities; and (3) quantify the costs associated with customer demands exceeding design levels.

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23 As approved by the Department in its previous order, Worcester weather data was found to be appropriate for th purpose of modeling Framingham sendout (Commonwealth Gas Company, D.P.U. 92-159, at 15).

In response to the Department's Directives, the Company requested New England Research Associates ("NERA") to perform a comprehensive cost-benefit analysis to identify the costs and benefits of alternative design-day a design-year standards (id.). The Company determined that NERA's cost-benefit analysis provides a reasonable approa development of the Company's design planning standards and has guided the Company's determination of its 1:50 desig standards (id.).

In addition, Commonwealth conducted a survey of 14 LDCs and three trade associations, both regionally and na to obtain information regarding their design winter standards (id., at 134). Of the eleven LDCs that responded, five use cold winter and six use a probabilistic approach ranging from 1:25 to 1:100 (id.). Accordingly, the Department finds tha Company has complied with these Directives.

Moreover, the Company was required to (a) demonstrate that it continues to explore ways to enhance its foreca model, particularly where the predictive ability of the model was low; (b) explain the difference in the predictive ability of t between Cambridge and the other divisions; and (c) evaluate the predictive power of its model over the past three to fou response, the Company stated that a new set of econometric models developed by the WEFA Group was utilized in the of its forecasts (id.). The Company indicates that based upon an ex-post and historical-fit analysis, the models have der strong predictive power (id. at 135). Accordingly, the Department finds that the Company has complied with this directiv

The Company was then directed to provide territory specific studies to develop a reliable database of building ty use, and market potential for small-scale cogeneration development (D.P.U. 92-159 at 107). In response, the Company that maintaining contact with its potential cogeneration customers and monitoring their status and interest in cogeneratio customer-by-customer basis is the most effective method for estimating the future load potential of the small cogeneratio

(COM-1 at 136). In addition, the Company hired WEFA to prepare a literature review covering all emerging markets in order to expand the Company's knowledge of the cogeneration market (id. at 137). The Department finds that the Company did not comply with this directive because it did not provide territory specific studies. The Department notes, that becaus additions conducive to cogeneration have been isolated and infrequent, further consideration of the circumstances surro scale cogeneration development is unnecessary. Therefore, the Department does not require additional information.

The Company was directed to provide further documentation of its gas-fired air conditioning forecast methodolo natural gas vehicle forecast methodology, electric conversion market forecast methodology, and DSM forecast methodol on the expanded experience of the Company and any new advances in these markets (DPU 92-159 at 107). The Comp revised its methodology for projecting load additions in the emerging markets of cogeneration, gas air conditioning, gas natural gas vehicles, as well as its DSM projection methodology. According to the Company, changes in the electric ut industry may cause decreases in the price of electricity relative to gas, the electric building conversion segment has bee the "emerging markets," and is embedded in the general data for commercial and industrial load.

The Company indicated that all projections of load in the emerging markets are based on the estimated gas cons existing projects and projects known to be slated for installation in 1996-2001. All DSM savings and projections are base explicitly on the series of Department orders that pertain to DSM savings, including Boston Gas Company, D.P.U. 94-15 and the Company's recent settlement pre-approving DSM programs that were developed based on the Company's exper delivering effective programs that are both well-managed and well-received.

The Department finds that the Company has not complied with this directive. The directive was relevant at the tir issued. However, the natural gas market in Massachusetts is undergoing significant changes. Therefore, at this time, th Department does not see value in requiring the Company to provide any additional documentation with regard to this dire

Directive Eight in D.P.U. 92-159 required the Company to provide a detailed methodology for forecasting load additions in the G-53 (large industrial and commercial) market, including specific analysis of market potential and marke programs, and to consider providing a range of forecasts for this class that reflects, at a minimum, the likely high and lov scenarios. In response, the Company provided detailed information for forecasting the migration of non-residential cust firm transportation. The Company states that no single methodology, taken alone, can be expected to be reliable (id. at Therefore, the Company combined three separate migration scenarios incorporating both empirical historical customer c best judgment of the Company's sales and executive staff (id.). The three scenarios attempt to model three possible futu Company also indicated that G-53 customers have be included in its broad group of commercial and industrial customer at 139). Accordingly, the Department finds that the Company has complied with this directive.

The Department then required Commonwealth to specify how the Company includes the load forecast outside th econometric model in its design day forecast and provide an analysis of the sendout per DD for exceptionally cold days response, the Company indicated that for design-day forecasts, it uses its forecasts of daily base load and average heat ("heat factor") for the month in which the design peak day occurs (id.). The forecasts of daily base load and heat facto developed outside the econometric model itself, but are based directly on the resulting forecasts (id.). The design peak the various divisions exceed the EDD levels at which sendout per EDD begins to decline and should not result in greater

EDD sendout (id. at 140). Therefore, the Company states that it has not adjusted its design peak-day forecast (id.). Accordingly, the Department finds that the Company has complied with this directive.

The Company was directed to fully explain the differences in its processes for acquiring commodity and capaci including transportation and storage services. In response, the Company identified the difference between the two proc indicated that the process the Company undertakes to acquire incremental capacity is similar to the commodity process the options to be evaluated are much more limited than with commodity (COM-1 at 141-143). The Company states that t because there are limited vendors of capacity, but there are over 100 potential, qualified suppliers of commodity in the n Accordingly, the Department finds that the Company has complied with this directive.

The Company was required to implement a methodology to compare conservation resources to other supply-sid resources (D.P.U. 92-259 at 108). In response, the Company implemented a Sendout portfolio optimization model that t supply and demand-side resource on an equal footing when developing the resource portfolio to meet firm sendout requi Accordingly, the Department finds that the Company has complied with this directive.

Directive Twelve concerned reporting on the Company's efforts to devise an appropriate methodology for compa conservation resources with other supply-side resources. The Company responded that DSM programs that pass the Department's cost-effectiveness tests, and/or that will be likely to benefit the portfolio and the firm customer for the entire particular DSM measures, are resources. Conversely, DSM programs that serve heterogeneous and dynamic sectors s the medium and large commercial/industrial customers who can readily change suppliers, are value-added services. Ac the Department finds that the Company has complied with this directive.

The Department required the Company to reexamine its reliance on firm supplies to refill the Company's storage response, the Company restructured its portfolio and changed its approach to procuring summer supplies, in particular t storage. Instead of relying on firm commodity supply contracts to provide gas for summer injection into storage, the Cor relies on spot market commodity purchases, delivered through the Company's firm long-haul capacity. Accordingly, the Department finds that the Company has complied with this directive.

Finally, the Company was required to document how each supply addresses portfolio needs that the Company h identified. In response, and in compliance with the Department's directive, the Company provided a detailed discussion Company's commodity supply contracts.

VIII. ORDER

Accordingly, after due notice, hearing, and consideration it is:

ORDERED: That Commonwealth Gas Company's petition for approval of its sendout forecast and supply be and hereby is approved; and it is

FURTHER ORDERED: That Commonwealth Gas Company follow all directives contained herein.

By Order of the Department,

James Connelly, Commissioner

W. Robert Keating, Commissioner

Paul B. Vasington, Commissioner

Eugene J. Sullivan, Jr., Commissioner

Appeal as to matters of law from any final decision, order or ruling of the Commission may be taken to the Supreme Juc Court by an aggrieved party in interest by the filing of a written petition praying that the Order of the Commission be mo aside in whole or in part.

Such petition for appeal shall be filed with the Secretary of the Commission within twenty days after the date of service c decision, order or ruling of the Commission, or within such further time as the Commission may allow upon request filed the expiration of twenty days after the date of service of said decision, order or ruling. Within ten days after such petitio filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy th the Clerk of said Court. (Sec. 5, Chapter 25, G.L. Ter. Ed., as most recently amended by Chapter 485 of the Acts of 19